

**UNITED STATES PATENT APPLICATION**

**MOVABLE CHUTE APPARATUSES AND METHODS FOR A MOWING  
MACHINE**

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### Description

## MOVABLE CHUTE APPARATUSES AND METHODS FOR A MOWING MACHINE

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### Technical Field

The subject matter disclosed herein is generally directed to chute  
apparatuses and methods useful for the blade housing of mowing machines  
such as lawn mowers. More particularly, the present subject matter is directed  
10 to chute apparatuses and methods for use with a mowing machine to  
selectively maintain cut grass clippings within the housing, such as for  
mulching, or to discharge the grass clippings from the housing through a chute  
by selectively and easily opening a discharge chute.

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### Background Art

Prior art mowing machines such as mulching lawn mowers typically  
include a housing or deck that has a flap cut therein. This flap is normally  
spring loaded and biased in a downward direction. When the flap is down, the  
deck has a continuous inner and outer surface so as to retain cut grass and  
20 other lawn clippings within the housing for mulching and downward ejection  
from the housing onto the lawn. When the flap is raised, an operator can  
attach an accessory chute at the opening to direct cut grass out of and away

from the housing. The accessory chute is typically attached by lifting the flap, placing the accessory chute under the flap, extending fingers on the accessory chute partially around the pivot point of the flap, and releasing the flap. The accessory chute is held in place by the pressure of the flap on the accessory  
5 chute.

As can readily be appreciated by persons skilled in the art, this prior art arrangement has numerous disadvantages. First and foremost, requiring a separate removable accessory for ejecting lawn clippings out and away from the mower is inefficient and inconvenient. An operator often places the chute  
10 away from the mower, leading to tedious trips back and forth from the mower storage area, and often resulting in loss of the accessory. Secondly, the irregular shape of a typical accessory chute makes it inconvenient to permanently attach to a typical mulching mower. It can be appreciated that any attempt to permanently attach a typical accessory chute to a mulching mower  
15 would result in an unwieldy and less maneuverable mower.

One typical chute is shown in U.S. Patent No. 4,897,988 to Schweitz et al. The flap containing a unitary curved surface forms a chute for deflecting cut grass out and away from the housing (Figs. 1-9). The flap is also able to rotate around a horizontal axis in order to attach a larger chute or collection bag.  
20 Despite this structure, there still is no way to close the housing so as to enter a mulching mode. Another integrated chute design is found in U.S. Patent No. 5,195,311 to Holland, which employs a spring loaded flap that rotates about a vertical axis (Figs. 16 and 17). The flap is biased away from the housing and is designed to collapse if it contacts an obstacle, but the flap is not designed to

operate in two distinct modes. The chute described by Holland is not capable of securing against the housing wall so as to enter a mulching mode, and there is likewise no securing mechanism to keep the chute secured in its open position.

- 5           It would therefore be advantageous to provide chute apparatuses and methods for use with a mowing machine to selectively maintain cut grass clippings within the housing, such as for mulching, or to discharge the grass clippings from the housing through a chute by selectively and easily opening a discharge chute without the need for tools or other separate attachments.

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#### Summary

- The subject matter disclosed herein provides movable chute apparatuses and methods for use with mowing machines such as lawn mowers. In one embodiment, a chute apparatus can comprise a chute flap
- 15   movable about an axis between a closed chute flap position and an open chute flap position, and a retaining flap movable about a different axis between a retaining position and a non-retaining position. The chute flap can be pivotally attached to the deck of a housing of a mowing machine and comprise a flange portion for attachment of the chute flap to the deck of the housing. The chute
- 20   flap can also comprise a wall portion which in the closed chute flap position can serve as a portion of the outer wall of the housing. In the open chute flap position, the chute flap can serve as a discharge chute for deflecting cut material such as grass clippings expelled from within the housing.

          The retaining flap can be biased in its retaining position if desired and

can, when the retaining flap is in its retaining position, secure and maintain the chute flap in its closed chute flap position such that the chute flap serves as a portion of the wall of the housing of the mowing machine. This configuration is advantageous when it is desirable to use the mowing machine without

5 discharging the cut material such as grass clippings from the housing, such as for mulching. The chute flap can be biased in its open chute flap position. To simply and easily convert the chute apparatus to a configuration for discharging cut material from the housing, the retaining flap can be lifted to its non-retaining position, and the chute flap can thereby be released or manually moved to its

10 open chute flap position. Once the chute flap is in its open chute flap position, the retaining flap can be moved back to its retaining position where it can provide physical support to maintain the chute flap in its open chute flap position.

In another embodiment, a chute apparatus can comprise a chute flap

15 movable about an axis between a closed chute flap position and an open chute flap position, and a retaining flap movable about a different axis between a retaining position and a non-retaining position. The chute flap can be pivotally attached to the outer wall of a housing of a mowing machine and biased in either direction as desired although it is envisioned that the chute flap be

20 biased toward its open chute flap position. The chute flap can comprise a wall portion which in the closed chute flap position can serve as a portion of the outer wall of the housing. In the open chute flap position, the chute flap can serve as a discharge chute for deflecting cut material such as grass clippings expelled from within the housing.

The retaining flap can be biased in its retaining position if desired and can, when the retaining flap is in its retaining position, maintain the chute flap in its closed chute flap position such that the chute flap serves as a portion of the wall of the housing of the mowing machine. This configuration is advantageous  
5 when it is desirable to use the mowing machine without discharging the cut material such as grass clippings from the housing, such as for mulching. To simply and easily convert the chute apparatus to a configuration for discharging cut material from the housing, the retaining flap can be lifted to its non-retaining position, and the chute flap can be moved to its open chute flap position. Once  
10 the chute flap is in its open chute flap position, the retaining flap can be moved back to its retaining position where it can provide a physical support for maintaining the chute flap in its open chute flap position.

Methods are also provided for moving a chute apparatus of a mowing machine. The methods generally comprise lifting a retaining flap on a mowing  
15 machine from a retaining position to a non-retaining position to allow a chute flap attached to the mowing machine to move from a closed position to an open position whereby the chute flap provides a discharge chute.

It is therefore an object to provide novel chute apparatuses and methods for use with a mowing machine to selectively maintain cut grass clippings within  
20 the housing, such as for mulching, or to discharge the grass clippings from the housing through a chute by selectively and easily opening a discharge chute.

An object of the presently disclosed subject matter having been stated hereinabove, which is achieved in whole or in part by the present subject matter, other objects will become evident as the description proceeds when

taken in connection with the accompanying drawings as best described herein below.

Brief Description of the Drawings

5           Figure 1 is a perspective view of a mowing machine with an embodiment of the movable chute apparatus;

          Figure 2A is a closer, perspective view of an embodiment of the movable chute apparatus in a configuration adapted for maintaining material such as cut grass within the housing of the mowing machine;

10           Figure 2B is a perspective view of the chute apparatus shown in Figure 2A with the chute apparatus moving toward a configuration adapted for discharge of material such as cut grass from the mowing machine housing;

          Figure 2C is a perspective view of the chute apparatus shown in Figures 2A and 2B in a configuration adapted for discharge of material such as cut  
15   grass from the mowing machine housing;

          Figure 3 is a top plan view of the chute apparatus shown in Figures 2A, 2B and 2C;

          Figure 4 is a side elevation view of the chute apparatus shown in Figures 2A, 2B and 2C;

20           Figure 5A is a perspective view of another embodiment of a chute apparatus in a configuration adapted for maintaining material such as cut grass within the housing of the mowing machine;

          Figure 5B is a perspective view of the chute apparatus shown in Figure 4A moving toward a configuration adapted for discharge of material such as cut

grass from the mowing machine housing; and

Figure 5C is a perspective view of the chute apparatus shown in Figures 5A and 5B in a configuration adapted for discharge of material such as cut grass from the mowing machine housing.

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#### Detailed Description

In accordance with the presently disclosed subject matter, and referring now to Figures 1, 2A, 2B, 2C, 3, and 4, an embodiment of a movable chute apparatus, generally designated **CA**, is shown for attachment to mowing machines such as a lawn mower, as shown in Figure 1. Chute apparatus **CA** can be used for selectively and easily switching from what may be referred to as a closed or mulching configuration to what may be referred to as an open configuration. In the closed configuration, chute apparatus **CA** is adapted for preventing material such as cut grass clippings from being discharged from a housing **H** of the mowing machine. In the open configuration, chute apparatus **CA** is adapted for providing a discharge chute for passage of cut material such as cut grass clippings expelled and exiting from housing **H**. As readily appreciated, housing **H** can house a cutting mechanism (not shown), such as a blade of a mowing machine, and housing **H** can comprise an upper deck **D** and an outer wall **W**, both of which typically are constructed of metal or plastic. Upper deck **D** and outer wall **W** can be suitably positioned with respect to one another and are usually substantially perpendicular to one another as shown. Both upper deck **D** and outer wall **W** serve to contain cut material such as cut grass clippings within housing **H** during operation of the mowing machine.



Chute apparatus **CA** as illustrated in Figures 1, 2A, 2B, 2C, 3 and 4 comprises a chute flap **CF** and a retaining flap **RF**. Retaining flap **RF** can be pivotally attached to housing **H** such as by use of any suitable pivotal connection **10** which can also include one or more biasing members such as, 5 for example, a torsion spring **12** to bias retaining flap **RF** toward its retaining position. Retaining flap **RF** is rotatably movable along a first axis **X1** between a retaining position shown in Figure 2A and a non-retaining position shown in Figure 2B as discussed below. First axis **X1** can be parallel or co-planar with deck **D**. Retaining flap **RF** can include a first portion **14** and a second portion 10 **16**. First portion **14** can be flat and extend along a plane from pivotal connection **10** with second portion **16** preferably rigidly extending from first portion **14** and also being flat but extending along a different plane than and preferably at least generally perpendicularly from first portion **14**. As shown, retaining flap **RF** can include a number of edges such as the opposing side 15 edges **18A** and **18B** of first portion **14**, opposing side edges **20A** and **20B** of second portion **16**, and end edge **22** of second portion **16**.

Chute flap **CF** as shown in Figures 1, 2A, 2B and 2C can be pivotally attached to housing **H**, such as at a pivot point created by attachment of chute flap **CF** to housing **H** through the use of fastener **30**, and is rotatably movable 20 along a second axis **X2** between a closed chute flap position shown in Figure 2A and an open chute flap position shown in Figure 2C. Second axis **X2** extends through fastener **30** and can be at least generally parallel with wall **W** of housing **H** and at least generally perpendicular with first axis **X1** associated

with retaining flap **RF**. Chute flap **CF** can include a flange portion **32** through which fastener **30** can extend and which can be flat and positioned above deck **D**. One or more biasing structures can be used to suitably bias chute flap **CF** in either its open chute flap position or its closed chute flap position as desired. It is envisioned though that chute flap **CF** can typically be biased toward its closed chute flap position, such as by a torsion spring **30A** as shown as one example beneath flange portion **32**. Flange portion **32** can include a number of side edges, such as side edges **34** and **36**, and side edge **34** can be structured and configured to rest against side edge **18A** of retaining flap **RF** to provide physical support to maintain chute flap **CF** in its open chute flap position when chute flap **CF** is in its open chute flap position and retaining flap **RF** is in its retaining position. Flange portion **32** can be rigidly formed as an extension from or connected with wall portion **40** of chute flap **CF**.

Wall portion **40** of chute flap **CF** preferably is of a shape adapted to cover an opening or slot **S** (best shown in Figure 2B) defined in housing **H** when chute flap **CF** is in its closed chute flap position (Figure 2A) as well as to provide a discharge chute when chute flap **CF** is in its open chute flap position (Figure 2C). As shown in Figures 1, 2A, 2B, 2C, 3 and 4, wall portion **40** can extend in a vertical orientation with respect to and at least generally perpendicular to flange portion **32**. Wall portion **40** can be of any suitable shape or configuration such as, for example the configuration illustrated in Figures 1, 2A, 2B, 2C, 3 and 4, and can include top edge **42**, opposing bottom edge **44**, and outermost wide edge **46**. Any suitable material or materials can

be used for construction of chute flap **CF** or retaining flap **RF**, such as metal or hardened plastic.

Chute apparatus **CA** is shown in Figure 2A in a configuration advantageous when it is desirable to use a mowing machine without a bag or without discharging the grass clippings, such as for mulching cut grass clippings. As shown in Figure 2A, chute flap **CF** is in its closed chute flap position and retaining flap **RF** is in its retaining position. First portion **14** of retaining flap **RF** rests flat upon at least a portion of housing **H** in a parallel relationship. Second portion **16** of retaining flap **RF** is positioned at least generally parallel to wall **W** but spaced a small distance apart from wall **W** such that second portion **16** can overlap a portion of chute flap **CF** to retain chute flap **CF** in its closed chute flap position as wall portion **40** of chute flap **CF** provides and serves as a portion of outer wall **W** of housing **H**. If desired, wall portion **40** of chute flap **CF** and second portion **16** of retaining flap **RF** can have a parallel relationship when chute flap **CF** is in its closed chute flap position and biased and maintained in that position by retaining flap **RF** in its retaining position. A parallel relationship can exist between flange portion **32** and first portion **14** of retaining flap **RF** when chute flap **CF** is in its closed chute position and retaining flap **RF** is in its retaining position. It is noted that chute flap **CF** can also include biasing structure for urging chute flap **CF** in either its closed chute flap position or its open chute flap position. It is also noted that retaining flap **RF** can also be in its retaining position without chute flap **CF** being in its closed chute flap position. In the configuration shown in Figure 2A, chute

apparatus **CA** serves to retain cut material such as grass clippings within housing **H**, such as for mulching.

Although retaining flap **RF** can be biased by torsion spring **12** toward its retaining position, retaining flap **RF** is pivotally movable, as shown in Figure 2B, on pivot connection **10** in the direction of arrow **A1** at least generally upwardly and at least partially away from wall **W** and some of deck **D**. As shown in Figure 2B, retaining flap **RF** has been moved from its retaining position and is moving toward or even can be said to have reached its non-retaining position where end edge **22** of retaining flap **RF** has been raised from its position shown in Figure 2A to free or release chute flap **CF** to move away from its closed chute flap position. Chute flap **CF** is shown moving toward its open chute flap position in the direction of arrow **A2** as wall portion **40** of chute flap **CF** moves away from wall **W** of housing **H** to expose slot **S** defined in wall **W**. As can be readily appreciated, slot **S** can be defined in housing **H** in any suitable shape and size and can be defined only in wall **W** if desired or can be defined in both wall **W** and extend to be defined in a portion of deck **D** preferably adjacent that portion of wall **W** defining slot **S**, as shown for example in and discussed hereinbelow with reference to Figure 5B. If slot **S** is defined in a portion of deck **D**, it can be understood that the underneath side of first portion **14** of retaining flap **RF** can serve as a portion of deck **D** of housing **H** when the retaining flap is in its retaining position.

Figure 2C illustrates chute apparatus **CA** in its open configuration where it can allow cut material such as grass clippings to exit from within housing **H**.

This position can be useful when mulching is not desired and when it is instead desirable to allow cut material to be expelled or discharged from housing **H** simply onto a lawn directly or into a bag for collection. As shown, chute flap **CF** has reached and is in its open chute flap position where wall portion **40** of chute flap **CF** no longer covers slot **S** and instead helps provide a discharge chute or wall for deflecting cut material discharging from housing **H**. While retaining flap **RF** no longer retains chute flap **CF** in its closed chute flap position, retaining flap **RF** has moved in the direction of arrow **A3** back to its retaining position and preferably provides physical support to maintain chute flap **CF** in its open chute flap position. More specifically, side edge **34** of chute flap **CF** can rest against side edge **18A** of retaining flap **RF** when retaining flap **RF** is in its retaining position and chute flap **CF** is in its open chute flap position to maintain chute flap **CF** in that position. This support can be especially beneficial if chute flap **CF** is biased toward its open chute flap position, and it can also be easier for retaining flap **RF** to be moved back to its non-retaining position when retaining flap **RF** is biased toward its retaining position.

To return chute apparatus **CA** to its closed configuration such as for mulching, retaining flap **RF** can simply be lifted to again move to its non-retaining position and which removes the previous physical support for chute flap **CF** and releases or frees chute flap **CF** to be manually moved or moved as a result of its biasing structure from its open chute flap position back to its closed chute flap position as shown in Figure 2A. Once chute flap **CF** is back in this position, retaining flap **RF** can be manually moved or moved as a result

of its biasing structure back to its retaining position as shown in Figure 2A where at least a portion of second portion **16** of retaining flap **RF** overlaps or overhangs a portion of wall portion **40** of chute flap **CF** to retain chute flap **CF** in its closed chute flap position. Biasing retaining flap **RF** in its retaining  
5 position such as with torsion spring **12** can facilitate changing the configuration of chute apparatus **CA** as can be appreciated by those of skill in the art. Biasing chute flap **CF** in its open chute flap position such as with torsion spring **30A** can also facilitate changing the configuration of chute apparatus **CA** as can be appreciated by those of skill in the art.

10 Figure 3 is a top plan view and Figure 4 is a side elevation view of chute apparatus **CA** as shown in Figures 1, 2A, 2B and 2C. The pivotal movements of retaining flap **RF** about first axis **X1** and chute flap **CF** about second axis **X2** are shown with phantom lines for purposes of illustration. Figure 3 also illustrates the abutment of edge **34** of flange portion **32** of chute flap **CF** with  
15 side edge **18A** of first portion **14** of retaining flap **RF**.

Figures 5A, 5B and 5C illustrate another embodiment of a chute apparatus **CA'**. Housing **H** with deck **D** and outer wall **W** can be the same as shown in Figure 1, 2A, 2B, 2C, 3 and 4. Retaining flap **RF** can also be the same. Slot **S'** though is shown defined in a portion of wall **W** as with the  
20 previous figures of drawings, but also can be extended and defined in a portion of deck **D**, as best shown in Figure 5B.

Chute flap **CF'** of chute apparatus **CA'** is different from chute flap **CF** from the previous figures of drawings by comprising basically a wall portion **40'** which is pivotally attached proximate or at an end thereof to wall **W** of housing

**H** so as to be movable about at least substantially vertical axis **X3** from the closed chute flap position of Figure 5A, to the intermediate position of Figure 5B, and then to the open chute flap position of Figure 5C. Any suitable structure can be used to attach chute flap **CF'** to housing **H** such as a hinge rod

5    **50** as illustrated in Figures 5A and 5B as an example. It can be understood that hinge rod **50** can pass through a portion of deck **D** of housing **H** if desired. Chute flap **CF'** can be biased, such as by a torsion spring **52**, toward either its closed chute flap position or its open chute flap position as desired as with chute flap **CF** discussed hereinabove. It is contemplated that wall portion **40'**

10   of chute flap **CF'** can be flush with wall **W** when chute flap **CF'** is in its closed chute flap position. The function of chute apparatus **CA'** can be the same as for chute apparatus **CA** except for the structural and attachment differences for chute flap **CF'** as described. Once chute flap **CF'** is in its open chute flap position as shown in Figure 5C, one or more side edges of retaining flap **RF**,

15   such as side edge **20A** of second portion **16** for example, can abut and provide physical support to chute flap **CF'** to maintain chute flap **CF'** in its open chute flap position and/or chute flap **CF'** can be biased in the open chute flap position.

It is therefore seen from the above description that the subject matter

20   disclosed herein provides chute apparatuses and methods which can simply and easily be used with a mowing machine in a configuration to selectively maintain cut material such as grass clippings within the housing, such as for mulching, or in a configuration to discharge the cut material from the housing through a chute by selectively and easily opening a discharge chute. The

change from one configuration to the other can be made very simply and easily by quick manual movement of one or more flaps as described herein and without the need for tools. As a result, the inconvenience associated with the location and attachment of separate chute accessories can be eliminated  
5 without compromising the versatility of the mowing machine. As can be appreciated by one of ordinary skill in the art, certain features of the above-described embodiments may be interchanged or omitted from additional embodiments as desired.

It will be understood that various details of the subject matter disclosed  
10 herein may be changed without departing from the scope of the subject matter.

Furthermore, the foregoing description is for the purpose of illustration only, and not for the purpose of limitation.